REMARKS

In the Office Action, claims 4 and 5 were rejected under 35 U.S.C. §103. Claim 3 was previously withdrawn due to a restriction requirement. Applicant believes that the rejections are improper for at least the reasons listed below. The Commissioner is hereby authorized to charge deposit account 02-1818 for any fees which are due and owing.

In the Office Action, claims 4 and 5 are rejected under 35 U.S.C. §103 in view of U.S. U.S. Patent No. 6,428,218 to Müssig ("*Müssig*") and U.S. Patent No. 5,570,446 to Zheng et al. ("*Zheng*"). The Patent Office relies primarily on *Müssig*, and thus further relies on *Zheng* to remedy the deficiencies of *Müssig*. Claim 4 was previously amended in order to clarify that the estimation of the heating center is performed along an axial direction of the optical fiber and that the positioning of the fibers along the axial direction is based on the estimation of the heating center.

Of the pending claims at issue, claim 4 is the sole independent claims. Claim 4 recites a method for fusion splicing an optical fiber using an optical fiber fusion splicer comprising a setting means for setting respective end surfaces of two optical fibers that are to be spliced in order to abut against each other, a heating means for generating an arc discharge between two discharge electrodes and heating an abutment portion of said optical fibers using a discharge beam, and an image pickup means for picking up an image of said discharge beam. The method includes:

(a) measuring, from image signals obtained by an image pickup means when a preliminary arc discharge is generated between discharge electrodes when no optical fibers have been placed in a discharge area, brightness distributions on a plurality of lines that are set at different positions along a rectilinear direction between a pair of discharge electrodes and run in a direction substantially at right angles to the rectilinear direction;

(b) estimating a heating center of the arc discharge along an axial direction (Z direction) of the optical fiber from the plurality of brightness distributions;

(c) positioning an abutment portion of two optical fibers in the estimated heating center by controlling a position of a setting means for setting respective end surfaces of the two optical fibers along the axial direction of the optical fiber; and

(d) heating the abutment portion by generating a main arc discharge between two discharge electrodes by controlling a heating means for generating the arc discharge between the two discharge electrodes.

In amended claim 4, the heating center of the arc discharge along the axial direction of the optical fiber is estimated based on the result of the preliminary arc discharge which is performed when no optical fibers have been placed in a discharge area. Then, the position of the setting means along the axial direction of the optical fiber is controlled in order to position the abutment portion of the optical fibers in the estimated heating center. (See, Specification, pg. 12, lines 3-13). Therefore, the positioning of the abutment portion of the optical fibers *along the axial direction is based on the result of the preliminary arc discharge.*

As recognized on page three of the Office Action, *Müssig* is distinguishable for a number of reasons. More specifically, *Müssig* does not disclose, teach or suggest (a) measuring, from image signals obtained by the image pickup means when a preliminary arc discharge is generated between said discharge electrodes when no optical fibers have been placed in a discharge area, brightness distributions on a plurality of lines that are set at different positions along a rectilinear direction between said discharge electrodes and run in a direction substantially at right angles to the rectilinear direction; (b) estimating a heating center of an arc discharge along an axial direction (i.e., the Z direction) from the plurality of brightness distributions, where the brightness distributions are measured as described above; and (c) controlling a position of said setting means along the axial direction of the optional fiber such that the abutment portion of said two optical fibers is positioned in the estimated heating center. In addition, Applicant respectfully submits that *Zheng* fails to cure the deficiencies of *Müssig*.

In the Office Action, the Examiner asserts that the above features (a) to (c) are disclosed in *Zheng*. In particular, the Examiner asserts that:

(i) a preliminary arc discharge between the discharge electrodes when no optical fibers are placed in the discharge area is disclosed in lines 17 to 39 and lines 53 to 67 in column 6 and in FIGS. 1, 2 and 4 of *Zheng*;

(ii) measurement of brightness distributions on a plurality of lines that are set at different positions along a rectilinear direction between the discharge electrodes and run in a direction

substantially at right angles to the rectilinear direction is disclosed in lines 21 to 42 in column 5 of *Zheng*;

(iii) estimation of the heating center of the arc discharge along the axial direction of the optical fiber from the plurality of brightness distributions is disclosed in lines 35 to 39 in column 6 of *Zheng*; and

(iv) positioning of the abutment portion of the optical fibers based on the estimated heating center is disclosed in line 62 in column 5 to line 16 in column 6 and in lines 1 to 23 in column 7 of *Zheng*.

With regard to objection (i) mentioned above, the preliminary arc discharge of *Zheng* is performed in order to fling out dirt and particles from the electrodes as described in lines 30 to 35 in column 6 of *Zheng*. Therefore, the purpose of the arc discharge is not to estimate the heating center of the arc discharge, but rather to prevent contamination of the optical fibers. The estimation of the heating center of the arc discharge based on a preliminary arc discharge is not suggested *Zheng*.

Regarding objection (ii), the description in lines 21 to 42 in column 5 of *Zheng* merely refers to an *illumination configuration* including "two lamps (9) illuminating two fibers (1, 1') in two directions perpendicular to each other and also perpendicular to the longitudinal direction of the fiber ends, the light from the lamps is made parallel by lenses (11) and entered into a camera (17) through reflecting elements (13) and a beam splitter (15), and a signal from the camera is transmitted to an image processing unit (19) and is visualized on a display element (21)." The illumination configuration is used to capture images digital *images of the fiber ends*. Indeed, *Zheng* describes that "during this stage, the images of the fiber ends are observed and in particular the outlines or contours thereof in order to decide whether the end surfaces are sufficiently perpendicular to the longitudinal directions of the fiber ends." (See, *Zheng*, col. 5, lines 37-38, and col. 5 line 66 to col. 6, line 3). In fact, *Zheng* is not concerned with imaging or measuring any parameters of the alleged gathered images *with respect to the preliminary arc discharge*. The imaging system is merely used to analyze certain geometries of the fiber ends. Applicant also notes that during the third stage 29, where the preliminary arc discharge is performed with the fibers spaced a large distance apart (i.e., when no optical fibers have been placed in a discharge area), *Zhang* does not even mention image capture, much less obtaining

any information with regard to the arc discharge itself. (See, *Zhang*, col. 6, lines 17-52). As mentioned above, the only purpose of the preliminary arc discharge in *Zhang* is to clear out any dust particles on the electrodes. Accordingly, *Zhang* does not disclose measuring, from image signals obtained by the image pickup means when a preliminary arc discharge is generated between said discharge electrodes when no optical fibers have been placed in a discharge area, brightness distributions on a plurality of lines that are set at different positions along a rectilinear direction between said discharge electrodes and run in a direction substantially at right angles to the rectilinear direction, as recited in claim 4. (See also, for example, lines corresponding to a plurality of lines A to D in FIG. 4 of the present application).

Regarding the Examiner's objection (iii), the description in lines 35 to 39 in column 6 of *Zheng* merely discloses a technique concerning displacement of the ends of the optical fibers from the predetermined contact position when the arc discharge is started. Moreover, it follows from the discussion above with regard to objection (ii), that *Zheng* does not disclose a technique to estimate the heating center of the arc discharge, much less along the axial direction of the optical fiber from a plurality of brightness distributions. In other words, because *Zheng* does not disclose imaging or measuring the arc discharge, it follows that *Zheng* does not disclose estimating a heating center of an arc discharge based on the plurality of brightness distributions from the obtained images.

Regarding objection (iv), the technique for positioning the abutment portion of the optical fibers along the axial direction of the optical fiber of the present application is entirely different from that of *Zheng*. In the present application, the position of the abutment portion of the optical fibers is determined based on the heating center of the arc discharge along the axial direction of the optical fibers which is estimated based on the result of the preliminary arc discharge, as described in lines 3 to 13 on page 12 of the specification of the present application. As discussed above with regard to objection (ii), *Zheng* does not disclose imaging the arc discharge, measuring brightness distribution lines of the arc discharge, or estimating a heating center of the arc discharge based on the preliminary arc discharge. Furthermore, the position of the abutment portion of the optical fibers (1 and 1') along an axial direction thereof (Z direction) is determined prior to the preliminary arc discharge. (See, *Zheng*, col. 6, lines 10-14 and Figs. 3a and 3b). Therefore, in *Zheng*, the position of the abutment portion of the optical fibers is not determined

from an estimated heating center of a preliminary arc discharge. Accordingly, *Zheng* does not disclose positioning of the abutment portion of the optical fibers based on the estimated heating center of the preliminary arc discharge.

Therefore, *Müssig* and *Zheng*, even if properly combinable, do teach, disclose or suggest all of the elements of claim 4. Accordingly, for at least the reasons set forth above, claim 4 and claim 5 that depends therefrom, are each patentably distinguished over the combination of *Müssig* and *Zheng* and are in condition for allowance.

Accordingly, Applicant respectfully submits that the present application is in condition for allowance and respectfully solicits reconsideration and allowance of same.

Respectfully submitted,

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